SALMONELLOSIS
(Non-Typhoid)

✓DISEASE AND EPIDEMIOLOGY

Clinical Description:

Gastroenteritis

Infection with non-typhoidal *Salmonella* usually results in gastroenteritis. The most common symptoms include diarrhea (sometimes bloody), stomach cramps, fever, nausea, and vomiting. Diarrhea is usually self-limiting, lasting about 3-7 days. Occasionally patients may require hospitalization due to severe dehydration, which is more common among infants and the elderly.

Enteric Fever

Enteric fever is the result of invasive disease and is characterized by fever and abdominal symptoms. Systemic illness more commonly results from infection with *S.* typhi, resulting in typhoid fever, however infection with *S.* paratyphi may also produce a similar but less severe syndrome.

Bacteremia and Vascular Infection

Any *Salmonella* serotype can cause bacteremia, however the syndrome is most common with *S.* cholerasuis and *S.* dublin infections.

Localized Infections

Approximately 5-10% of persons with *Salmonella* bacteremia develop localized infections which may present as septicemia, abscess, arthritis, or cholecystitis.

Causative Agent:

Salmonellosis refers to disease caused by any serotype of bacteria in the genus *Salmonella,* other than *Salmonella typhi* (the *Salmonella* species that causes typhoid fever). A new classification for *Salmonella* has been adopted based on DNA relatedness. This new nomenclature recognizes only two species: *Salmonella bongori* and *Salmonella enterica*, with all human pathogens regarded as serovars within the subspecies of *S. enterica*. For example, the proposed nomenclature would change *S. typhi* to *S. enterica* serovar Typhi, abbreviated *S.* Typhi, and *Salmonella enterica* serovar Enteritidis would be referred to as *S.* Enteritidis instead of *S. enteritidis.*

Differential Diagnosis:

Shigella, E. coli O157:H7, *Campylobacter, Yersinia enterocolitca*, and bacterial food poisoning may show similar signs and symptoms.

Laboratory identification:

Culture of stool, blood, or urine are the preferred method for *Salmonella* diagnosis. Rapid tests using EIA, LA, DNA probes, and monoclonal antibodies have been developed, but their availability is limited. Serologic evaluation for *Salmonella* agglutinins is not recommended.

> **UPHL:** The Utah Public Health Laboratory accepts stool specimens for isolation and serotyping. All isolates must be submitted to UPHL.

Treatment:

Antibiotics are not generally recommended for patients with uncomplicated non-typhoidal salmonellosis because treatment does not shorten the duration of disease and may prolong the carrier state. However, treatment is recommended for:

- Patients with an increased risk of invasive disease
- Infants < 3 months
- Patients with chronic gastrointestinal tract disease, malignant neoplasms, or hemoglobinopathies
- Patients with HIV or other immunosuppressive illness or therapy
- Patients with severe colitis

Ampicillin, amoxicillin, TMP-SMX, cefotaxime, or ceftiaxone are recommended for susceptible strains. Strains acquired in developing countries are often resistant to many antimicrobial agents, but are usually susceptible to ceftriaxone, cefotaxime, and fluoroquinolines.

Typhimurium and Newport are increasingly resistant in the US, with about 1/3 of Typhimurium isolates resistant to ampicillin, chloramphenicol, streptomycin sulfate, sulfonamides, and tetracycline, and about 11% of Newport isolates resistant to ceftriaxone.

Case fatality:

The case fatality rate for non-typhoidal *Salmonella* infections is less than 1%. Elderly persons age 65 or older have the highest case fatality rate, with nearly two-thirds of all deaths due to *Salmonella* infections among the elderly.

Reservoir:

Salmonella is widely distributed in animals, including livestock, pets, poultry, other birds, reptiles, and amphibians. Most infected animals are chronic carriers. Humans can also be a source of infection.

Transmission:

Salmonella are transmitted via the fecal-oral route. The most common mode of transmission is ingestion of food or water that has been contaminated with human or animal feces. This includes raw or undercooked poultry, eggs, and egg products; undercooked meats; and raw milk or milk products. However, any food contaminated with the bacteria can be a source of infection. In most circumstances, contaminated food must be subject to time and temperature conditions that allow reproduction of the bacteria to numbers that can cause disease in those ingesting the contaminated food. In addition, reptiles such as iguanas and lizards are chronic carriers of these bacteria and can be sources of infection. Person-to-person spread can also occur, especially among household contacts, preschool children in daycare, and the elderly and developmentally disabled living in residential facilities. Transmission can also occur from person to person through certain types of sexual contact (e.g., oral-anal contact).

Susceptibility:
Susceptibility is general and usually increased by achlorhydria, antacid treatment, gastrointestinal surgery, prior or current broad-spectrum antibiotic treatment, nepoplastic disease, immunosuppressive treatment, and other debilitating conditions like malnutrition. A large dose of organisms (≥100,000) is usually needed to cause infection, but the infectious dose may be lower for certain serovars and for certain susceptible individuals such as children, the elderly, and the immunocompromised.

Incubation period:
The incubation period for salmonellosis is 12-36 hours, with a range of 6–72 hours. However, incubation periods longer than three days have been documented.

Period of communicability:
The disease is communicable for as long as the infected person excretes *Salmonella* bacteria in his/her stool. This can last from days to months, depending on the serovar, but rarely lasts more than one year. Treatment with antibiotics can prolong carriage by suppressing competing bacteria in the gastrointestinal tract.

Epidemiology:
Salmonellosis has a worldwide distribution, with approximately 1.4 million cases occurring annually in the US. About 60–80% of cases are sporadic, but large outbreaks have occurred in institutional settings and from common food sources. The largest common-vehicle outbreak of salmonellosis ever recognized in the US was caused by ice cream made by a national producer from premix that had been transported in contaminated tanker trucks. In Utah, 50% of *Salmonella* infections are caused by 3 *Salmonella* serovars. *S.* typhimurium and *S.* enteritidis each cause roughly 20% of serotyped infections, with *S.* Newport causing roughly 10%.

✓PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:
- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention
- Identify clusters or outbreaks of this disease and determine the source.
- Identify cases and sources to prevent further transmission.

Prevention:
Environmental Measures
Implicated food items must be removed from consumption. A decision about testing implicated food items can be made in consultation with the enteric epidemiologist at UDOH and UPHL.
The general policy of UPHL is to test only food samples implicated in suspected outbreaks, not in single cases (except when botulism is suspected). If holders of food implicated in single case incidents would like their food tested, they may be referred to a

private laboratory that will test food or store the food in their freezer for a period of time in case additional reports are received. However, in certain circumstances, a single, confirmed case with leftover food that had been consumed within the incubation period may be considered for testing.

Personal Preventive Measures/Education

To avoid exposure to *Salmonella,* persons should:

- Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, after changing diapers, and after touching pets or other animals (especially reptiles).
- Wash the child's hands as well as their own hands after changing diapers, and dispose of diapers in a closed-lid garbage can.
- Wash hands thoroughly and frequently when ill with diarrhea or when caring for someone with diarrhea. Hands should be scrubbed for at least 15–20 seconds after cleaning the bathroom; after using the toilet or helping someone use the toilet; after changing diapers; before handling food; and before eating.
- Keep food that will be eaten raw, such as vegetables, from becoming contaminated by animal-derived food products.
- Avoid letting infants or young children touch reptiles, such as turtles or iguanas, or their cages.
- If elderly or immunocompromised, avoid reptiles when choosing pets.
- In a daycare or school, do not use reptiles as classroom pets.
- Make sure to thoroughly cook all food products from animals, especially poultry and eggs, and avoid consuming raw or cracked eggs, unpasteurized milk, or other unpasteurized dairy products.

Discuss transmission risks that may result from oral-anal sexual contact. Latex barrier protection (e.g., dental dam) may prevent the spread of *Salmonella* to a case's sexual partners and may prevent exposure to and transmission of other fecal-oral pathogens.

Chemoprophylaxis:

None.

Vaccine:

None.

Isolation and quarantine requirements:

Isolation: Food handlers with salmonellosis must be excluded from work until diarrhea has resolved.

NOTE: A food handler is any person directly preparing or handling food. This can include a patient care or childcare provider.

Hospital: Enteric precautions.

Quarantine: Contacts with diarrhea who are food handlers should be considered the same as a case and shall be handled in the same fashion. Otherwise, no restrictions.

NOTE: In certain circumstances, cases, ill contacts, and/or asymptomatic contacts who are food handlers may be required to have negative stool samples prior to returning to work. The local health department will decide which cases and/or contacts will need negative stool samples prior to returning to work and whether 1 or 2 negative samples is necessary. If a case or contact has been treated with an antimicrobial agent, the stool specimen should not be collected until at least 48 hours after cessation of therapy. If 2 negative stool samples are determined to be necessary they should be taken at least 24 hours apart.

✓CASE INVESTIGATION

Reporting:

All cases of salmonellosis should be reported to public health.

Case definition:

Salmonellosis (2005)

Clinical description

An illness of variable severity commonly manifested by diarrhea, abdominal pain, nausea, and sometimes vomiting. Asymptomatic infections may occur, and the organism may cause extraintestinal infections.

Laboratory criteria for diagnosis

Isolation of *Salmonella* from a clinical specimen

Case classification

Probable: clinically compatible case that is epidemiologically linked to a confirmed case.

Confirmed: a case that meets the laboratory criteria for diagnosis. When available, O and H antigen serotype characterization should be reported.

Comment

For users of the legacy National Electronic Telecommunications System for Surveillance (NETSS), laboratory-confirmed isolates are also reported via the Public Health Laboratory Information System (PHLIS), which is managed by the Foodborne and Diarrheal Diseases Branch, Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC. The National Electronic Disease Surveillance System (NEDSS) or NEDSS compatible systems will eventually replace PHLIS; users of NEDSS or compatible systems which report to CDC should not report via PHLIS.

Both asymptomatic infections and infections at sites other than the gastrointestinal tract, if laboratory confirmed, are considered confirmed cases that should be reported.

Case Investigation Process:

- Food handlers should be excluded from work until diarrhea has resolved. Negative stool specimens may also be required.
- Assure isolate submission to UPHL.

Outbreaks:

CDC defines a food-borne outbreak as, "an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food". In order to confirm an outbreak of salmonellosis, the same *Salmonella* species must be isolated from clinical specimens from at least 2 ill persons or the species must be isolated from an epidemiologically implicated food. The source of the infection should be identified and measures to identify additional ill persons and/or to remove the source from consumers should be taken. Control of person-to-person transmission requires special emphasis on personal cleanliness and sanitary disposal of feces.

Identification of case contacts and management:

Daycare

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow-up on cases in daycare settings. General recommendations include:

- Children with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- Children with *Salmonella* infection who have no diarrhea and are not otherwise ill may be excluded or may remain in the program if special precautions are taken.
- Most staff in childcare programs are considered food handlers. Those with *Salmonella* in their stool (symptomatic or not) can remain on site but must not prepare food or feed children until their diarrhea has resolved. Negative stool specimens may be required.

School

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow up on cases in school settings. General recommendations include:

- Students or staff with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- Students or staff with *Salmonella* who do not handle food, have no diarrhea or have mild diarrhea, and are not otherwise sick may remain in school if special precautions are taken.
- Students or staff who handle food and have *Salmonella* infection (symptomatic or not) must not prepare food until their diarrhea has resolved. Negative stool specimens may be required.

Community Residential Programs

Actions taken in response to a case of salmonellosis in a community residential program will depend on the type of program and the level of functioning of the residents.

In long-term care facilities, residents with salmonellosis should be placed on standard (including enteric) precautions until their symptoms subside. Staff members who give direct patient care (e.g., feed patients, give mouth or denture care, or give medications) are considered food handlers and should be treated as such. In addition, staff members

with *Salmonella* infection who are not food handlers should not work until their diarrhea is resolved.

In residential facilities for the developmentally disabled, staff and clients with salmonellosis must refrain from handling or preparing food for other residents until their diarrhea has subsided. Negative stool specimens may be required. In addition, staff members with *Salmonella* infection who are not food handlers should not work until their diarrhea is resolved.

✓REFERENCES

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